

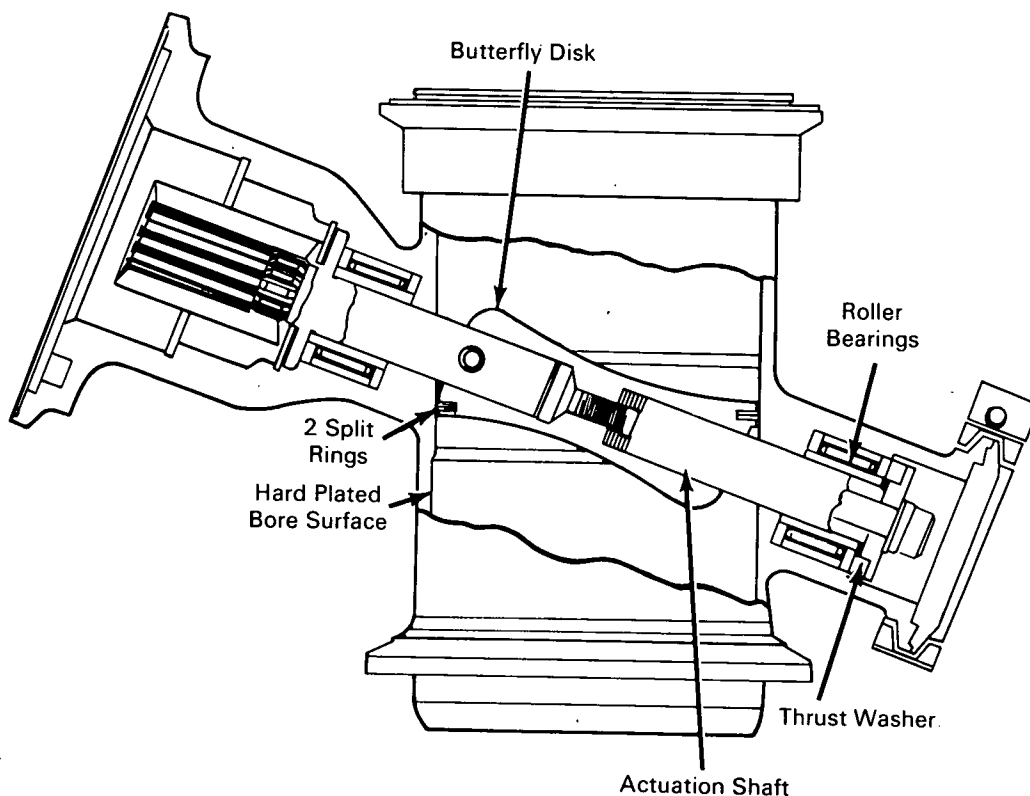


AEC-NASA TECH BRIEF



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Butterfly Valve with Metal Seals Controls Flow of Hydrogen from Cryogenic Through High Temperatures



A butterfly valve with metal seals has been designed and developed to operate satisfactorily over a temperature range of -423° to $+1440^{\circ}\text{F}$ with hydrogen as a medium and in a radiation environment. Commercially available valves using polymers as seals generally operate in a restricted temperature range (usually -65° to $+400^{\circ}\text{F}$) and are not suitable in a radiation environment.

Media flow is controlled by an internal butterfly disk which is rotated by an actuation shaft. Axial and thrust loads induced by the differential pressure across the disk are compensated by two bearings and the thrust washer. Disk sealing is accomplished by two split rings contained in a peripheral groove in the disk which contact a hard plated bore surface. The disk actuation shaft is cast 20 degrees from the

(continued overleaf)

centerline of the flow path to obtain a continuous circular seal. Actuation torque is minimized by use of the roller bearings.

The selection of component materials is based on high mechanical properties as a function of temperature and radiation tolerance. The design fulfills the operating characteristics and component expansion/contraction in the extreme temperature environments. Numerous development tests have demonstrated adequate performance and endurance. Three types of valve actuators have been used:

- a. Electropneumatic, infinite position activator
- b. Pneumatic rack and piston, on-off activator
- c. Pneumatic rack and piston with three-way solenoid pilot for incremental positioning.

This valve can be used as a flow control device or an on-off valve using cryogenic or hot gas media. Mounting parts can be modified to accept other types of fittings to be compatible with system requirements. A 4-inch valve has been constructed.

Note:

Inquiries concerning this innovation may be directed to:

Technology Utilization Officer
AEC-NASA Space Nuclear Propulsion
Office
U.S. Atomic Energy Commission
Washington, D.C. 20545
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No patent action is contemplated by AEC or NASA.

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